

## C L A I M S

We Claim:

1. A synthesizer for forming a polymer chain by sequentially adding monomer units found in one of a plurality of reagent solutions, the synthesizer comprising:
  - a. a first vial and a second vial, wherein the first vial and the second vial are configured for holding the plurality of reagent solutions;
  - b. means for dispensing configured for dispensing the plurality of reagent solutions into the first and second vials; and
  - c. means for selectively expelling material from the first and second vials, configured for coupling to the first and second vials and purging material from a selective one of the first vial and the second vial.
2. The synthesizer according to claim 1 further comprising a cartridge configured for holding the first vial and the second vial.
3. The synthesizer according to claim 2 wherein the cartridge holds the first vial and the second vial along a circular perimeter of the cartridge.
4. The synthesizer according to claim 3 further comprising a motor coupled to the cartridge configured for selectively rotating the cartridge relative to the means for sequentially dispensing.
5. The synthesizer according to claim 4 further comprising a drain plate coupled to the cartridge for separating the first vial into a first bank of vials and the second vial into a second bank of vials.

1     6.     The synthesizer according to claim 1 further comprising a chamber bowl coupled to  
2     the means for selectively expelling wherein the chamber bowl contains any spilled material.

1     7.     The synthesizer according to claim 6 further comprising a seal coupled to the chamber  
2     bowl to prevent spilled material from escaping outside the chamber bowl.

1     8.     The synthesizer according to claim 1 wherein the means for selectively expelling  
2     further comprises:

- 3           a.     means for forming a pressure differential between a first opening and a second  
4           opening of the selective one of the first vial and the second vial; and  
5           b.     a waste tube to collect material expelled from the selective one of the first vial  
6           and the second vial.

1     9.     The synthesizer according to claim 1 wherein the means for dispensing further  
2     comprises:

- 3           a.     a plurality of valves for controlling dispensing of the plurality of reagent  
4           solutions; and  
5           b.     a plurality of dispense lines wherein each of the plurality of the dispense lines  
6           is coupled to a corresponding one of the plurality of valves for delivering one  
7           of the plurality of reagent solutions to a selected vial.

1     10.    The synthesizer according to claim 1 wherein each of the first vial and the second vial  
2     further comprise a precision bored interior configured to hold a frit for retaining a solid  
3     material above the frit, and further wherein the first vial and the second vial are configured to  
4     maintain a consistent flow through the precision bored interior.

- 1 11. A synthesizer for forming a polymer chain by sequentially adding monomer units  
2 found in a plurality of reagent solutions, the synthesizer comprising:
- 3 a. a first vial configured to hold the plurality of reagent solutions;  
4 b. a second vial configured to hold the plurality of reagent solutions;  
5 c. a cartridge to hold the first vial and the second vial;  
6 d. a dispensing system to dispense the plurality of reagent solutions into the first  
7 and second vials; and  
8 e. a purging system to remove material from a selective one of the first vial and  
9 the second vial.
12. The synthesizer according to claim 11 wherein the cartridge holds the first vial and the  
second vial along a circular perimeter of the cartridge.
13. The synthesizer according to claim 11 further comprising a chamber bowl coupled to  
the purging system wherein the chamber bowl contains spilled material.
14. The synthesizer according to claim 13 further comprising a seal coupled to the  
chamber bowl to prevent spilled material from escaping outside the chamber bowl.
15. The synthesizer according to claim 11 wherein the purging system further comprises:
- a. means for forming a pressure differential between a first opening and a second  
opening of the selective one of the first vial and the second vial; and  
b. a waste tube to collect material expelled from the selective one of the first vial  
and the second vial.

1 16. The synthesizer according to claim 11 wherein the dispensing system further  
2 comprises:

- 3 a. a plurality of valves for controlling dispensing of the plurality of reagent  
4 solutions; and  
5 b. a plurality of dispense lines each coupled to one of the plurality of valves for  
6 delivering a corresponding one of the reagent solutions to a selected vial.

1 17. The synthesizer according to claim 11 wherein each of the first vial and the second  
2 vial further comprise a precision bored interior configured to hold a frit for retaining a solid  
3 material above the frit, and further wherein the first vial and the second vial are configured to  
4 maintain a consistent flow through the precision bored interior.

1 18. The synthesizer according to claim 11 further comprising a drain plate coupled to the  
2 cartridge for separating the first vial into a first bank of vials and the second vial into a  
3 second bank of vials.

1 19. The synthesizer according to claim 11 further comprising a motor coupled to the  
2 cartridge to selectively rotate the cartridge relative to the dispensing system.

1 20. A synthesizer for creating a polymer chain by sequentially adding monomer units  
2 found in one of a plurality of reagent solutions, the synthesizer comprising:  
3 a. a plurality of vials wherein each of the plurality of vials is configured to hold  
4 material including the plurality of reagent solutions;

- 5           b.     a cartridge for holding the plurality of vials and dividing the plurality of vials  
6               into a first bank of vials including at least one of the plurality of vials and a  
7               second bank of vials including at least one of the plurality of vials;  
8           c.     a dispensing system configured to sequentially dispense selective ones of the  
9               plurality of reagent solutions into the plurality of vials; and  
10          d.     a purging system configured to selectively purge material from the first bank of  
11               vials and the second bank of vials.

1   21.    The synthesizer according to claim 20 further comprising a first drain coupled to the  
2   first bank of vials and a second drain coupled to the second bank of vials, the first and second  
3   drains each configured for selectively coupling with the purging system for draining the first  
4   bank of vials and the second bank of vials.

1   22.    The synthesizer according to claim 21 wherein the purging system further comprises a  
2   waste tube capable of selectively coupling with a selective one of the first drain and the  
3   second drain to purge material from the first bank of vials and the second bank of vials.

1   23.    The synthesizer according to claim 20 wherein the dispensing system further  
2   comprises:

- 3           a.     a plurality of valves for controlling the dispensing of the plurality of reagent  
4               solutions; and  
5           b.     a plurality of dispense lines each coupled to one of the plurality of valves for  
6               delivering a corresponding one of the plurality of reagent solutions to a selected  
7               vial.

1 24. A purging system configured for use with a synthesizer containing a first bank of vials  
2 and a second bank of vials wherein the first bank of vials has a first drain and the second  
3 bank of vials has a second drain, the purging system comprising:

- 4 a. a pressurizing system for creating a pressure differential within a selective one  
5 of the first bank of vials and the second bank of vials; and  
6 b. a first waste tube capable of coupling with a selective one of the first drain to  
7 purge material from the first bank of vials and the second drain to purge  
8 material from the second bank of vials.

1 25. The purging system according to claim 24 further comprising a drain seal coupled to  
2 the first waste tube for creating a flexible seal between the first waste tube and the selective  
3 one of the first drain and the second drain.

1 26. The purging system according to claim 24 further comprising a second waste tube  
2 capable of selectively coupling with the first drain to purge the material from the first bank of  
3 vials and the second drain to purge the material from the second bank of vials wherein the  
4 purging system is capable of selectively and simultaneously purging the first bank of vials and  
5 the second bank of vials.

1 27. A vial comprising a precision bored interior configured to hold a frit for retaining  
2 material within the vial above the frit and maintain a consistent flow through the precision  
3 bored interior during a flushing procedure.

1 28. The vial according to claim 27 further comprising an exterior dimension configured to  
2 fit within a receiving hole of a cartridge, thereby providing a pressure-tight seal between the  
3 vial and the cartridge.

1 29. A vial comprising an exterior dimension configured to fit within a receiving hole of a  
2 cartridge thereby providing a pressure-tight seal between the vial and the cartridge and a  
3 precision bored interior to maintain a consistent flow through the precision bored interior  
4 during a flushing procedure.

1 30. The vial according to claim 29 further comprising a frit positioned within the precision  
2 bored interior to retain material within the vial above the frit.

1 31. A method of selectively and sequentially dispensing a plurality of reagent solutions to  
2 a plurality of vials divided into a first bank of vials and a second bank of vials and selectively  
3 purging material from the first bank of vials and the second bank of vials, comprising the  
4 steps of:

- 5 a. dispensing one or more of the plurality of reagent solutions to a selective one  
6 or more of the plurality of vials; and
- 7 b. purging material from a selective one of the first bank of vials and the second  
8 bank of vials.

1 32. The method according to claim 31 wherein during the step of dispensing one of the  
2 plurality of reagent solutions is dispensed into one or more of the plurality of vials in a  
3 parallel fashion.

1 33. The method according to claim 31 wherein during the step of dispensing one or more  
2 of the plurality of reagent solutions are dispensed into one or more of the plurality of vials in  
3 a serial fashion.

- 1     34.     A method of selectively purging material from a selective one of a first vial and a  
2     second vial comprising the steps of:
- 3           a.     coupling a waste tube to a selective one of a first drain corresponding to the  
4           first vial and a second drain corresponding to the second vial; and
- 5           b.     forming a pressure differential between an interior and an exterior of the  
6           selective one of the first vial and the second vial, thereby expelling material  
7           from the selective one of the first vial and the second vial through the waste  
8           tube.